

Cultivar and Germplasm Release

RELEASE OF SWEET CHILI PEPPER (*CAPSICUM CHINENSE* JACQ.) CULTIVARS ‘AMANECER’, ‘BONANZA’, ‘CARNAVAL’, ‘ENCANTO’ AND ‘PASIÓN’^{1,2}

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Among the five domesticated species of *Capsicum*, two are important to the agriculture and cuisine of Puerto Rico: *C. annuum* L. and *C. chinense* Jacq. Commercial cultivars are available to growers of cubanelle and bell *C. annuum* peppers. By contrast, plantings of *C. chinense*, whose small, usually red fruits are locally known as *aji dulce* (literally “sweet chili pepper”), have traditionally been carried out using farmer-saved seed of landraces since seed of improved cultivars has not been available. As the local name implies, *C. chinense* grown in Puerto Rico has little pungency. Although some of the local literature in Puerto Rico written in English has used the term “sweet cherry pepper” or “sweet pepper” for *C. chinense*, Wessel-Beaver et al. (2022) proposed “sweet chili pepper” as a term that more clearly distinguishes *aji dulce* from other non-pungent peppers. The non-pungent to mildly pungent landraces found in Puerto Rico are likely the result of selection by local farmers for mild flavor variants among the generally highly pungent types of *C. chinense* found in other parts of the Caribbean.

Origin

In the 1990s, agronomist Essau Orengo-Santiago collected landraces of *aji dulce* from around the island. Some of the phenotypes of those landraces are described in Orengo-Santiago et al. (1999). In 2007, the Agricultural Experiment Station (AES) of the University of Puerto Rico, Mayagüez Campus (UPRM) initiated an *aji dulce* breeding program in which landraces collected by Orengo-Santiago that had viable seed were grown out at the Lajas substation (S₀ generation). Superior phenotypes (vigorous, disease-free plants with large fruit size) were covered with mesh bags to obtain selfed seed. In 2008, 24 S₁ lines were planted in Lajas. Each progeny row consisted of 20 plants. Between and within rows, selections were made and were covered with mesh bags for a few weeks to obtain selfed seed. Data on fruit yield and average fruit weight was obtained for each progeny row. Yield and average fruit weight data of individual plants selected for selfing was also noted. A sample of fruits from each selfed plant was collected and evaluated for fruit color and shape. Plants that had pungent fruit were discarded. Ten S₂ lines for testing were selected based on parental plant data and parental progeny row

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data. Attention was given to including diverse fruit phenotypes. The 10 S_2 lines were evaluated in replicated trials at Lajas, Juana Díaz and Corozal in late 2008. In addition to the field data obtained in these trials (described in Wessel-Beaver et al., 2022), fruit from each line was sampled and presented to growers, extension agents and others at field days held at the Lajas and Corozal substations. Samples of fruits of each line were also presented at various UPRM Cooperative Extension Service activities focusing on events where most participants were women, and at the UPRM annual agricultural fair (*Cinco Días con Nuestra Tierra*) which received a very diverse crowd of visitors. Based on results from field trials and evaluations from growers and consumers, five lines were advanced. S_2 seed of ten to 15 plants of each of the five lines was planted in isolation in 2013 at the Isabela AES. Within a line, seed was bulked to obtain S_3 seed. This seed was used to carry out additional field trials in 2014 and 2015 (González-Berrocables, 2018), a laboratory study of fruit characteristics (Hernandez-Zerega, 2016), and a study in containers and the field in 2017 (Altema et al., 2022). The five lines are being released by the AES-UPRM under the cultivar names ‘Amanecer’, ‘Bonanza’, ‘Carnaval’, ‘Encanto’ and ‘Pasión’ (Figure 1). In the 2008 trials mentioned the cultivars are referred to as experimental lines 2, 7, 9, 8 and 6, respectively (Wessel-Beaver et al., 2022).

Cultivar Description

The *Capsicum* descriptors of the International Plant Germplasm Research Institute (1995) were used to describe the fruit of each cultivar (Table 1). The fruits of ‘Amanecer’ are usually bell shaped, sometimes with an appendage resembling a beak or point at the distal end. Within the same plant some fruits can be round or triangular. ‘Bonanza’ produces large, uniformly triangular shaped fruit (wider at the proximal end). ‘Carnaval’ produces lobed fruit in the shape of a small pumpkin [the “arroyo” type described by Orengo-Santiago et al. (1999)]. Fruits have a thicker pericarp compared to the other

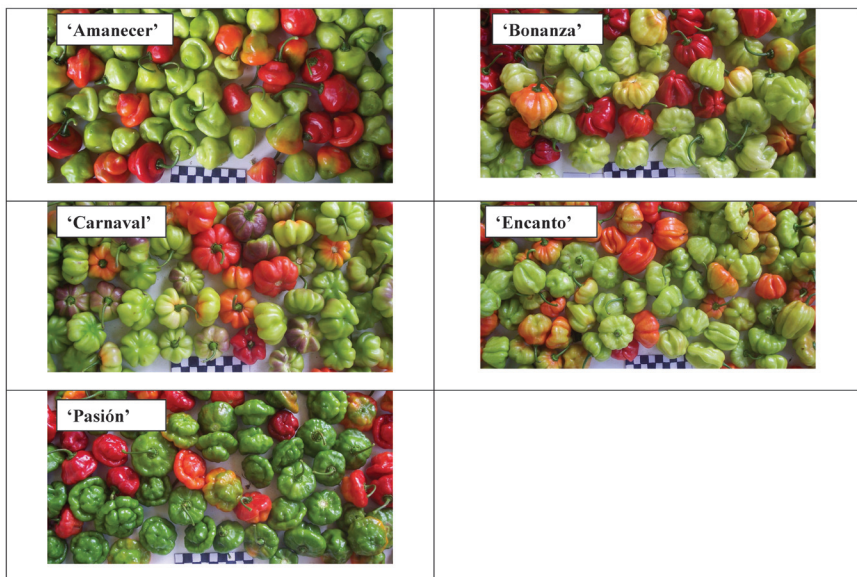


FIGURE 1. New cultivars of sweet chili pepper (*ají dulce*) (*Capsicum chinense*) for Puerto Rico. Black or white squares measure 1 cm².

TABLE 1.—Phenotypic descriptions of sweet chili pepper (*Capsicum chinense*) cultivars ‘Amanecer’, ‘Bonanza’, ‘Carnaval’, ‘Encanto’ and ‘Pasión’. Table modified from Wessel-Beaver et al. (2022).

Cultivar	Fruit color ¹			Fruit shape				Comments
	Anthocyanin coloring	Just before maturity	At maturity	At blossom end ²	At pedicel end ²	Length to diameter ratio ³	Lobing	
Amanecer	Absent	Lt. green	Red	Pointed, usually campanulate; some blunt or some round or triangular	Truncate	>1	None	Some fruits with a “beak” or appendage at distal end
Bonanza	Absent	Lt. green	Red	Strongly triangular	Sunken	1	Strong	Large, uniform fruit
Carnaval	Purple stripes on stems; purple fruit	Purple to Lt. green	Orange to red	Blocky	Sunken	<1	Intermediate	“Arroyo” type (Orengo-Santiago et al., 1999); very thick pericarp
Encanto	Absent	Lt. green	Red	Triangular or elongated; some blocky	Sunken	Variable	Strong	More variable shapes than other cultivars
Pasión	Absent	Dk. green	Dk. red	Campanulate	Blunt to sunken	<1	Intermediate	Cap or bonnet shape; “chato” type (Orengo-Santiago et al., 1999); very thin pericarp

¹Lt. = light; Dk. = dark.

²Based on *Capsicum* descriptors from the International Plant Germplasm Research Institute (1995).

³>1 = length greater than width (elongated); 1 = approximately same length and width (round); <1 = length smaller than width (flatten).

cultivars and the skin of immature fruits is purplish green in color due to the presence of anthocyanins. Purple pigmentation in the stem is evident from the seedling stage making this cultivar easy to distinguish from the others. The leaves of ‘Carnaval’ are smoother and more lanceolate than those of the other cultivars. At maturity, fruits of ‘Carnaval’ are red, but with a slightly orange tint. By comparison, ‘Amanecer’, ‘Bonanza’ and ‘Encanto’ tend to have red fruits at maturity with no hint of orange. ‘Encanto’ produces fruits of variable shape, generally triangular to elongated, and occasionally blocky. Fruits of ‘Encanto’ are notably more variable than fruits of the other cultivars. The fruit of ‘Pasión’ are flattened (the “chato” phenotype described by Orengo-Santiago et al. [1999]; the landrace referred to as ‘Chato’ by González-Flores [1972] was likely similar to ‘Pasión’) with a much thinner pericarp compared to the other four cultivars. The immature fruits have a distinct dark green appearance; fully mature fruits turn a very dark scarlet. At both the immature and mature stages, the color of ‘Pasión’ fruits is distinctly different from that of the other four cultivars. Leaves of ‘Pasión’ are more strongly wrinkled compared to the other cultivars and tend to cup upwards. All the cultivars have an erect growth habit except for ‘Carnaval’ which has a compact growth habit.

Adaptation and Yield

Days to flowering was recorded in a single trial (container trial #2; Altema et al., 2023), in which ‘Carnaval’ was the earliest to flower at 50.1 d after transplanting. There were no significant differences in days to flowering among ‘Amanecer’, ‘Bonanza’ and ‘Pasión’; days to flowering in those cultivars ranged from 58.6 to 61.6 d after transplanting. The trial did not include ‘Encanto’.

Cultivar x trial interactions were not significant for average fruit weight, but were highly significant for plant height, number of fruit per plant and fruit yield per plant (Wessel-Beaver et al., 2022). Trials did not include a standard cultivar of sweet chili pepper since the cultivars described here are the first to be formally released in Puerto Rico. In every trial ‘Carnaval’ had either the highest average fruit weight (five out of 10 trials) or was among the cultivars with the greatest fruit weight (Table 2). ‘Bonanza’ tended to have the next highest fruit weight. ‘Pasión’ had the lowest fruit weight in six out of 10 trials and was among the cultivars with the lowest fruit weight in the other trials.

Despite significant cultivar x trial interactions, some trends were observed for plant height. In five out of 10 trials ‘Pasión’ was either the tallest cultivar or among the tallest cultivars (Table 3). ‘Pasión’ tended to be the tallest cultivar in the three trials where there were no significant differences and was of intermediate height in the other two trials. By contrast, ‘Carnaval’ was the shortest cultivar in five out of 10 trials, tended to be the shortest cultivar in the three trials without significant height differences, and was of intermediate height in the other two trials.

The relative performance of the cultivars in terms of yield and number of fruits per hectare was strongly dependent on the trial (i.e., location and year) (Tables 4 and 5). However, ‘Pasión’ was among the lowest yielding cultivars in most of the trials. Across trials, ‘Pasión’ and ‘Encanto’ averaged lower yields than ‘Amanecer’, ‘Bonanza’ and ‘Carnaval’.

Altema et al. (2022) evaluated soilless container production of *ají dulce*. They concluded that ‘Amanecer’ and ‘Bonanza’ are better suited to container production than ‘Pasión’ and ‘Carnaval’ (‘Encanto’ was not tested). In that trial all tested cultivars performed well in commercial mixes based on sphagnum moss but performed poorly in containers with coconut coir. Container production of *ají dulce* can be an alternative to field production.

Wessel-Beaver et al. (2022) observed that factors related to seed production varied considerably among the cultivars (Table 6). This information will be useful in planning and managing seed production for commercial sales of the cultivars. ‘Pasión’ and

TABLE 2.—Average fruit weight of five cultivars of sweet chili pepper (*aji dulce*, *Capsicum chinense*) in trials in various locations in Puerto Rico from 2009 to 2017. Except for two container trials in Mayagüez in 2017, all were replicated field trials.

Cultivar	Average fruit weight (g)									
	Corozal 2009	Juana Díaz 2009	Lajas 2009	Isabela 2014 ¹	Lajas 2014 ¹	Juana Díaz 2015 ¹	Mayagüez 2015 ¹	Mayagüez container trial #1 2017 ²	Mayagüez container trial #2 2017 ²	Mayagüez Cultivar mean
Amanecer	9.0 c	10.7 c	10.3 c	13.8 a	9.6 b	12.3 ab	10.7 b	6.9 b	11.3 c	12.5 c
Bonanza	11.1 b	14.4 a	12.4 b	12.3 ab	10.2 b	10.9 bc	13.7 a	11.8 a	12.8 b	13.5 b
Carnaval	12.4 a	14.7 a	15.2 a	15.5 a	13.1 a	14.3 a	13.4 a	9.2 ab	17.6 a	14.8 a
Encanto	9.2 c	12.2 b	11.0 c	9.3 bc	9.8 b	10.9 bc	11.9 ab	—	—	10.6 c
Pasión	6.9 d	8.9 d	7.7 d	7.2 c	5.5 c	8.3 c	9.4 b	7.0 b	8.1 d	6.9 d
Trial mean	9.7 b	12.2 a	11.3 a	11.6 a	9.6 b	11.3 a	11.9 a	8.7 b	12.0 a	11.9 a

Among cultivars within a column, means followed by a common letter are not significantly different according to Fisher's least significant difference at the 0.05 probability level. In the last row, trial means followed by a common letter are not significantly different at the 0.05 probability level.

¹Data from González-Berrocates (2018).

²Data from Altama et al. (2022)

TABLE 3.—Mean plant height of five cultivars of sweet chili pepper (*aji dulce*, *Capsicum chinense*) in trials in various locations in Puerto Rico from 2009 to 2017. Except for two container trials in Mayagüez in 2017, all were replicated field trials.

Cultivar	Plant height (cm)										
	Corozal 2009 ¹	Juana Diaz 2009 ¹	Lajas 2009 ¹	Isabela 2014 ²	Lajas 2014 ²	Juana Diaz 2015 ²	Mayagüez 2015 ²	Mayagüez container trial #1 2017 ³	Mayagüez container trial #2 2017 ³	Mayagüez Cultivar mean 2017 ⁴	
Amanecer	35.0 ab	70.1 a	46.4 b	102.0 a	51.0 a	69.0 b	57.0 a	46.6 b	54.0 a	52.9 b	58.4 a
Bonanza	34.0 ab	61.4 b	41.0 c	101.0 a	40.0 a	66.0 b	50.0 a	61.1 a	45.9 b	61.8 a	56.2 a
Carnaval	26.0 c	54.3 c	46.2 b	68.0 a	37.0 a	62.0 b	48.0 a	32.0 c	39.7 c	32.9 c	44.6 b
Encanto	37.4 a	64.9 b	55.2 a	92.0 a	56.0 a	69.0 b	53.0 a	—	—	—	61.1 a
Pasión	33.3 b	69.0 a	53.5 a	103.0 a	51.0 a	81.0 a	61.0 a	54.5 ab	51.2 a	52.8 b	61.0 a
Trial mean	33.1 d	63.9 b	48.5 c	93.2 a	47.0 c	69.4 b	53.8 c	48.6 c	47.7 c	50.1 c	55.5

Among cultivars within a column, means followed by a common letter are not significantly different according to Fisher's least significant difference at the 0.05 probability level. In the last row, trial means followed by a common letter are not significantly different at the 0.05 probability level.

¹Plant height measured at 11 weeks after transplanting (WAT).

²Data from González-Berrocales (2018). Plant height measured at 22 WAT for Isabela 2014, 24 WAT for Lajas 2014, and 24 WAT for Juana Diaz 2015 and Mayagüez 2015.

³Data from Almeida et al. (2022). Plant height measured at 18 WAT. Means are averaged over five planting mixes.

⁴Data from Almeida et al. (2022). Plant height measured at 17 WAT.

TABLE 4.—*Mean yield of five cultivars of sweet chili pepper (aji dulce, Capsicum chinense) in trials in Puerto Rico from 2009 to 2017. Except for two container trials in Mayagüez in 2017, all were replicated field trials.*

Cultivar	Fruit yield (kg/ha)										
	Corozal 2009	Juana Diaz 2009	Lajas 2009	Isabela 2014 ¹	Lajas 2014 ¹	Juana Diaz 2015 ¹	Mayagüez 2015 ¹	Mayagüez container trial #1 2017 ²	Mayagüez container trial #2 2017 ²	Mayagüez 2017 ²	Cultivar mean
Amanecer	10,667 a	10,992 a	6,024 b	4,447 a	6,648 a	21,835 a	8,648 a	2,655 b	17,976 a	15,088 b	10,498 a
Bonanza	9,359 ab	8,879 b	4,781 b	4,427 a	2,996 a	18,755 a	8,234 a	8,916 a	13,419 bc	30,516 a	11,028 a
Carnaval	7,524 bc	11,646 a	11,165 a	4,990 a	6,362 a	23,727 a	9,100 a	1,579 b	14,047 b	12,899 b	10,304 a
Encanto	7,039 bc	11,007 a	9,504 a	2,825 a	6,846 a	12,505 a	5,819 a	—	—	—	7,935 b
Pasión	6,338 c	5,917 c	6,305 b	5,174 a	4,959 a	13,716 a	6,145 a	2,009 b	11,177 c	4,880 c	6,662 b
Trial mean	8,185 cd	9,688 bc	7,556 cd	4,373 d	5,562 cd	18,108 a	7,589 cd	3,790 d	14,155 ab	15,846 ab	9,485

Among cultivars within a column, means followed by a common letter are not significantly different according to Fisher's least significant difference at the 0.05 probability level. In the last row, trial means followed by a common letter are not significantly different at the 0.05 probability level.

¹Data from González-Berrocals (2018).

²Data from Altema et al. (2022)

TABLE 5.—Mean number of fruits per plant of five cultivars of sweet chili pepper (*aji dulce*, *Capsicum chinense*) in trials in Puerto Rico from 2009 to 2017. Except for two container trials in Mayagüez in 2017, all were replicated field trials.

Cultivar	Number of fruits per plant											
	Corozal 2009	Juana Díaz 2009	Lajas 2009	Isabela 2014 ¹	Lajas 2014 ¹	Juana Díaz 2015 ¹	Mayagüez 2015 ¹	Mayagüez container trial #1 2017 ²	Mayagüez container trial #2 2017 ²	Mayagüez 2017 ²	Cultivar mean	
Amanecer	136 a	145 a	82 b	37 a	89 a	247 a	113 a	19 b	89 a	66 b	102 a	
Bonanza	96 bc	93 c	54 c	38 a	41 a	238 a	85 a	40 a	58 b	126 a	87 a	
Carnaval	70 c	113 bc	103 ab	38 a	66 a	232 a	95 a	10 b	45 c	48 b	82 a	
Encanto	89 bc	126 ab	120 a	38 a	97 a	161 a	68 a	—	—	—	86 a	
Pasión	107 b	97 c	117 a	93 a	119 a	228 a	89 a	17 b	77 a	40 b	98 a	
Trial mean	100 bc	115 b	95 bcd	49 ef	82 cd	221 a	90 bcd	22 f	67 de	70 cde	91	

Among cultivars within a column, means followed by a common letter are not significantly different according to Fisher's least significant difference at the 0.05 probability level. In the last row, trial means followed by a common letter are not significantly different at the 0.05 probability level.

¹Data from González-Berrocates (2018).

²Data from Alteira et al. (2022).

TABLE 6.—Weight of 500 seeds, seed yield per kilogram of fruit, per plant, and per individual fruit, and number of seeds per fruit of five cultivars of sweet chili pepper, *Capsicum chinense*, produced in Lajas, Puerto Rico, in 2009. Data from Wessel-Beaver et al. (2022).

Cultivar	500 seed weight (g)	Seed yield per kilogram of fruit (g)	Seed yield per plant (g)	Seed yield per fruit (g)	Number of seeds per fruit
Amanecer	2.36 a ⁴	11.5 ab	7.3 b	0.113 ab	23.94 ab
Bonanza	2.00 b	4.2 c	3.6 b	0.032 b	8.00 b
Carnaval	2.49 a	9.6 bc	13.1 ab	0.105 ab	21.08 ab
Encanto	2.23 ab	1.7 c	1.9 b	0.020 b	4.48 b
Pasión	2.42 a	20.5 a	27.5 a	0.201 a	41.53 a

Within a column, means followed by a common letter are not significantly different according to Fisher's least significant difference at the 0.05 probability level.

'Amanecer' produced the greatest seed yield per kilogram of fruit. In 'Pasión', seed yield per kilogram of fruit was about five to twelve times as great as that of the cultivars with the lowest seed yield ('Bonanza' and 'Encanto'). Seed of pepper species is commonly sold by the ounce. The number of seeds per ounce ranged from 5693 in 'Carnaval' to 7088 in 'Bonanza' (201 and 250 seeds per gram, respectively).

Insect and Disease Susceptibility

The pepper weevil, *Anthonomus eugenii* Cano, was observed to infect all five cultivars in trials in Isabela, Mayagüez, Lajas, Corozal and Juana Díaz. The weevil is endemic to Puerto Rico and can cause yield loss in all *Capsicum* species. Pepper weevil damage includes premature fruit drop and the presence of larva in harvested fruits. 'Pasión' was judged to be somewhat more susceptible than the other four cultivars.

Fungal diseases such as *Rhizoctonia*, *Fusarium* and *Choanephora* sp. were occasionally observed to be associated with stem and foliar symptoms in all cultivars in field trials. Plants testing positive for *Tobacco mosaic virus* (TMV), *Tomato etch virus* (TEV), *Potato virus Y* (PVY) and *Cucumber mosaic virus* (CMV) presented symptoms such as cupped, chlorotic, mottled and deformed leaves as well as plant stunting (Wessel-Beaver et al., 2022). However, the cultivars described herein were not formally evaluated for susceptibility to the diseases mentioned here.

Fruit Quality

Hernandez-Zerega (2016) evaluated skin color (luminosity, hue angle and chroma) in 'Amanecer', 'Pasión', 'Carnaval' and 'Bonanza' at immature ("green") and mature ("red") stages. At both maturity stages, 'Pasión' exhibited a unique color profile compared to 'Amanecer', 'Carnaval' and 'Bonanza'. At the immature stage, its fruits had a lower luminosity, greater hue angle and lower chroma resulting in fruits with a strong, but dull, green color. The skin color of immature fruit of the other cultivars tested was more luminous and lighter green. At the mature stage the fruits of 'Pasión' turned a very dark red or scarlet color. At both maturity stages the color of 'Pasión' is distinctive and apparent to the unaided eye. In consumer surveys, participants found this unique color to be attractive. 'Pasión' is being released primarily for its unique fruit shape and color despite its low yields.

Hernandez-Zerega (2016) found that all tested cultivars ('Encanto' was not included) had high moisture content (90.57 to 93.28%), low protein (0.53 to 0.86%), low fat content

(0.05 to 0.12%), low dietary fiber (4.51 to 7.09%) and are an excellent source of vitamin C (92.9 to 148.86 mg/100 g). 'Pasión' had the highest β -carotene content (57 mg/100 g) and flavonoid content (338.51 mg QE/100 g); these values are associated with deeper red color. Mature fruit of 'Amanecer' had the highest vitamin C (148.86 mg/100 g) and phenolic content (385.79 mg GAE/100 g). Pungency, as measured by Scoville Heat Units (SHU), ranged from 35 to 49 SHU in 'Amanecer', 'Bonanza' and 'Carnaval', values significantly lower than the 80 SHU of 'Pasión'. All these values are in the range expected for sweet (non-pungent) peppers.

Uses

González et al. (1970) described the fruit of *ají dulce* (mistakenly identified in that publication as *C. frutescens*) as "... mildly pungent and hav[ing] a very rich aroma." In Puerto Rico, *ají dulce* is primarily an ingredient of *sofrito*, a mixture of chopped onion (*Allium cepa* L.), garlic (*Allium sativum* L.), culantro (recao) (*Eryngium foetidum* L.), coriander (*Coriandrum sativum* L.), and pepper (usually a combination of *ají dulce* and cooking pepper) (*Capsicum* spp.) used to flavor several local dishes, especially beans (*Phaseolus vulgaris* L.). All the cultivars presented here can be used in *sofrito* or any dish that calls for *ají dulce*. Growers wishing to harvest seed of these cultivars for new plantings should be aware that insects can potentially cross-pollinate *ají dulce* (Tanksey, 1984). Small cages with insect netting (Bosland, 1993) can be used to cover plants for seed production.

Availability of Seed

If importation regulations of the country of the recipient researcher permit receiving seed by mail, small samples of 'Bonanza', 'Encanto', 'Amanecer', 'Pasión' and 'Carnaval' for testing are available from the author (Department of Agro-environmental Sciences, UPR-RUM, PO Box 9000, Mayagüez, PR 00681-9000, USA). Cost of procuring the necessary phytosanitary permits will be charged to the recipient. For commercial-sized lots, contact the Deputy Director, Puerto Rico Agricultural Experiment Station, Jardín Botánico Sur, 1193 Guayacán, San Juan, PR 00926, USA.

LITERATURE CITED

- Altema, R., L. Wessel-Beaver, and A.M. Linares Ramírez, 2022. Container production of four sweet chili pepper (*Capsicum chinense* Jacq.) lines using soilless substrates. *J. Agric. Univ. P.R.* 106(1): 15-32. Doi.org/10.46429/jaupr.v106i1.21048
- Bosland, P.W., 1993. An effective plant field cage to increase the production of genetically pure chili (*Capsicum* spp.) seed. *HortScience* 28(10): 1053.
- González, M.A., E. Díaz-Negrón, H. Cancel, and A.C. Rivera, 1970. Freeze-drying of sweet pepper. *J. Agric. Univ. P.R.* 54 (1): 133-148. Doi.org/10.46429/jaupr.v54i1.11119
- González-Bercoales, K.E., 2018. Evaluación de características hortícolas de cinco líneas avanzadas de ají dulce (*Capsicum chinense* Jacq.). M.S. thesis, University of Puerto Rico, Mayagüez Campus. 49 pages.
- González-Flores, M., 1973 (reprint). El huerto casero. Agricultural Extension Service, College of Agricultural Sciences, University of Puerto Rico. Bulletin 50M, H-52.
- Hernandez-Zerega, L.-C., 2016. Compositional and phytochemical characterization of four improved varieties of Puerto Rico sweet chili pepper (*Capsicum chinense*). M.S. thesis. University of Puerto Rico, Mayagüez Campus. 95 pages.
- International Plant Genetic Resources Institute, 1995. Descriptors for *Capsicum* (*Capsicum* spp.). International Plant Genetic Resources Institute, Rome, Italy. https://www.bioversityinternational.org/fileadmin/_migrated/uploads/tx_news/Descriptors_for_capsicum__Capsicum_spp.__345.pdf.

- Orengo-Santiago, E., N. Semidey, and A. Armstrong, 1999. Conjunto tecnológico para la producción de ají dulce. University of Puerto Rico, Mayagüez Campus, College of Agricultural Sciences, Agricultural Experiment Station, Publication No. 157. Río Piedras, Puerto Rico.
- Tanksley, S.D., 1984. High rates of cross-pollination in chili pepper. *HortScience* 19(4): 580-582.
- Wessel-Beaver, L., S. L. Martínez-Garrastazú, J. C. Rodrigues, E. Rosa-Márquez, G. Fornaris-Rullán, and A. González-Vélez, 2022. Performance of sweet chili pepper (*Capsicum chinense* Jacq.) landraces in three agricultural zones of Puerto Rico. *J. Agric. Univ. P.R.* 106(2): 203-227. Doi.org/10.46429/jaupr.v106i2.21154.

